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ABSTRACT

Imaging system having a sensor array with photocells that permit the monitoring of light levels while the sensor is exposed to a scene, and the ability to accurately avoid saturation on a per column, row, or array basis. The sensor array supports variable dynamic range by allowing variable integration times for different columns or rows of the array, thereby improving image quality of a scene in which there are both strong and weak light areas. In one embodiment, the photocell includes a parasitic multi-emitter bipolar junction transistor (BJT) acting as a photodetector. The parasitic device is part of a saturation detection circuit and also supports an electronic shutter mechanism. The parasitic BJT also permits increased sensitivity over some previous CMOS approaches. The photocell design is also spatially efficient, using in one embodiment only four MOSFETs in addition to the parasitic BJT. The embodiments of the invention are particularly useful in CMOS active pixel sensors used in imaging systems such as the digital camera.